

## CLAIMS

1. A method of operating a MALDI mass spectrometer, the method comprising the steps of:

5 directing a first laser shot onto a MALDI sample so as to generate a sample spectrum,

analyzing the sample spectrum and generating an output signal if the sample spectrum possesses a predetermined criteria, and

determining position of a second laser shot to be directed onto the MALDI sample in response to generation of the output signal.

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2. The method of claim 1, wherein the analyzing step comprises:

summing the signal intensity of the sample spectrum, and

generating the output signal if the sum of the signal intensity of the sample spectrum exceeds a predetermined threshold.

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3. The method of claim 1, wherein the analyzing step comprises:

summing the signal intensity of a predetermined portion of the sample spectrum, and

20 generating the output signal if the sum of the signal intensity of the predetermined portion of the sample spectrum exceeds a predetermined threshold.

4. The method of claim 1, wherein the analyzing step comprises:

determining a number of peak heights of the sample spectrum, and

25 generating the output signal if any of the number of peak heights of the sample spectrum exceed a predetermined threshold.

5. The method of claim 1, wherein the determining step comprises directing the second laser shot onto the MALDI sample at a position which is a predetermined distance away from the position on which the first laser shot was directed onto the MALDI sample.

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6. The method of claim 1, wherein the determining step comprises directing the second laser shot onto the MALDI sample at a position which is a predetermined direction away from the position on which the first laser shot was directed onto the MALDI sample.

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7. A MALDI mass spectrometer, comprising:

a laser source, and

a processing unit electrically coupled to the laser source, the processing unit comprising (i) a processor, and (ii) a memory device electrically coupled to the processor, the memory device having stored therein a plurality of instructions which, when executed by the processor, causes the processor to:

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(a) operate the laser source to direct a first laser shot onto a MALDI sample so as to generate a sample spectrum,

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(b) analyze the sample spectrum and generate an output signal if the sample spectrum possesses a predetermined criteria, and

(c) determine position of a second laser shot to be directed onto the MALDI sample in response to generation of the output signal.

8. The MALDI mass spectrometer of claim 7, wherein the plurality of instructions, when executed by the processor, further cause the processor to:

sum the signal intensity of the sample spectrum, and

5 generate the output signal if the sum of the signal intensity of the sample spectrum exceeds a predetermined threshold.

9. The MALDI mass spectrometer of claim 7, wherein the plurality of instructions, when executed by the processor, further cause the processor to:

10 sum the signal intensity of a predetermined portion of the sample spectrum, and

generate the output signal if the sum of the signal intensity of the predetermined portion of the sample spectrum exceeds a predetermined threshold.

10. The MALDI mass spectrometer of claim 7, wherein the plurality of instructions, when executed by the processor, further cause the processor to:

determine a number of peak heights of the sample spectrum, and

15 generate the output signal if any of the number of peak heights of the sample spectrum exceed a predetermined threshold.

20 11. The MALDI mass spectrometer of claim 7, wherein the plurality of instructions, when executed by the processor, further cause the processor to operate the laser source to direct the second laser shot onto the MALDI sample at a position which is a predetermined distance away from the position on which the first laser shot was directed onto the MALDI sample.

12. The MALDI mass spectrometer of claim 7, wherein the plurality of instructions, when executed by the processor, further cause the processor to operate the laser source to direct the second laser shot onto the MALDI sample at a position which is a predetermined direction away from the position on which the first laser  
5 shot was directed onto the MALDI sample.

13. A method of operating a MALDI mass spectrometer, the method comprising the step of:

performing a survey scan of a MALDI sample so as to generate a  
10 plurality of sample spectra,

analyzing each of the plurality of sample spectra and generating an electronic record indicative of locations on the MALDI sample which correspond to each of the plurality of sample spectra that possesses a predetermined criteria, and

directing a laser focus over the MALDI sample based on the electronic  
15 record.

14. The method of claim 13, wherein the performing step comprises scanning the MALDI sample in a logarithmic spiral pattern.

20 15. The method of claim 14, wherein scanning the MALDI sample in the logarithmic spiral pattern comprises operating a mirror array so as to move the laser focus over the MALDI sample in the logarithmic spiral pattern.

16. The method of claim 13, wherein the analyzing step comprises:  
summing the signal intensity of each of the plurality of sample spectra,  
and  
updating the electronic record if the sum of the signal intensity of any  
5 of the plurality of sample spectra exceeds a predetermined threshold.

17. The method of claim 13, wherein the analyzing step comprises:  
summing the signal intensity of a predetermined portion of each of the  
plurality of sample spectra, and  
10 updating the electronic record if the sum of the signal intensity of the  
predetermined portion of any of the plurality of sample spectrum exceeds a  
predetermined threshold.

18. The method of claim 13, wherein the analyzing step comprises:  
15 determining a number of peak heights of each of the plurality of  
sample spectra, and  
updating the electronic record if any of the number of peak heights of  
any of the plurality of sample spectra exceeds a predetermined threshold.